Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

FRESH-WATER AQUARIA.

L. MURBACH.

The lover of nature, taking his early spring walks, often feels the desire to cultivate a nearer acquaintance with the living things that he sees in ponds and pools along his way. He may dip up samples here and there, taking some water weed and a string of the jelly beads containing toads' eggs, place them in glass jars or aquaria at home, and gain further pleasure, for a few days at most, and then the whole mass becomes foul and is thrown away. His ill-success is due to the improper balance between animals and to the popular misconception that an aquarium with animal life should be uncovered so that the animals can get air to breathe; and the remedy lies in keeping the aquarium, once properly balanced from one spring to another, so well covered that scarcely any evaporation of water can take place. To this then may be added new organisms from time to time.

None of the numerous notices on the keeping of aquaria that I have seen describe permanent aquaria without changing the water; yet this is one of the most desirable features — to keep the aquarium, year in year out, for observing the interesting succession of forms, often including representatives of animal groups from Protozoa to Crustacea, with an almost equal diversity of aquatic plants.

Some of the pond scum (algæ), drawn by light and adhering to the side of the glass, may be made to decorate the side of the aquarium with almost any pattern in green — letters, or your monogram if you choose. Some of my experience may be useful to the reader, and I gladly give it for what it may be worth.

Seeing the algæ in my largest aquarium accumulate on the side most strongly lighted, it occurred to me that they might be made to form a definite design by regulating the light.

First a stencil of paper or pasteboard was used, but as this was not permanent enough, one of my students, living next door to a tinsmith, cut out the monogram of our school and attached it to the outside of the aquarium, having previously cleaned the inside with a scraper. In a few weeks the letters "D. H. S." were sharply marked by the sun's ray-pencils and the microscopic green plants within. (See figure in *Journ. Applied Micros.*, July, 1899, Vol. II, No. 7.) The stencil may be removed at any time for inspection, but should be kept in position the half of each day, while the strongest light falls on the aquarium to keep the letters from being obliterated. This experiment serves to illustrate the movement of green plants towards the source of light, and has interested many of our visitors.

Such balanced aquaria also have a practical value in the schoolroom or laboratory; each one will have its own fauna, and may serve as a source of animalculæ — Amœbæ and other Protozoa so highly prized by the young teacher — and larger animals and plants for demonstration, experiment or research, in more nearly their natural environment, than those kept in water changed daily. This last spring we had a nice illustration of this fact; some fairy shrimps (Branchipus) were placed in a glass jar with water and plants of their habitat, and a few were placed in one of the balanced aquaria of the same size and receiving the same lighting. Those in the first jar died in a few days (the common experience of every one who has tried to keep them in the laboratory for demonstration), while those in the aquarium lived three times longer.

In one small aquarium jar, set up over a year ago, containing mostly diatoms, Oscillaria, some water fleas and Rotatoria, there has been a good supply of Amœbæ for class use. Another larger one, kept over two and one half years, in which a large snail, some water weed, and smaller animals constitute the balance, furnishes sun animalcules for demonstration. The largest one, with glass plate sides, slate bottom and ends, has been kept nearly two years without change or addition of water. It is stocked with aquatic plants, Cladophora, Myriophyllum, Lemna, Wolffia, Anacharis, and many single-celled algæ. The largest animal representative is a so-called "bull-head" (one of the species of Uranidæ), about four inches long, kept principally for the balance, and because he needs no further attention than a few earthworms every few days. In this aquarium fresh-water polyps, Polyzoa, and other interesting forms appear in their season.

In speaking of the time these aquaria have been kept, it is to be understood without changing the water but covered in such a way as to require very little or no additions of water to supply evaporation.

The aëration of the water for the breathing of animals will be readily seen to come from the oxygen given out by the plants while they feed (during photo-syntax) on the carbonic acid gas given out by the animals. The only thing needing attention is the feeding of such animals as cannot find their source of food in the aquaria themselves, and this should be done so carefully that no food is left to decay.

For aquaria almost any kind of glass vessel that can be securely covered against dust and bacteria may be used — jam jars, battery jars, culture dishes and globes for the smaller window aquaria; window glass, properly cemented into wooden frames that are kept coated with paraffin or asphalt varnish, for a medium size; and slate bottom and ends, with plate-glass sides, for the larger though more expensive ones.

In setting up the aquaria it is better to begin with water from some clean pond containing considerable plant and animal life. Fill up to within a few inches of the top with water, and then add about $\frac{1}{25}$ its bulk of plants and animals; or hydrant water may be used, adding some plants, and later the animals desired. Where there is no choice, snails and Crustaceæ are the most convenient for use, unless they are hostile to the organisms desired for experiment. The snails feed on the plants, giving these carbonic acid in turn for food, while the Crustaceæ feed mostly on the débris from other organisms.

If the animals keep near the surface, too many are probably present, and some must be removed or more plants added. When the plants become yellow they are too abundant or have not had light enough. In some cases the water becomes foul on first setting up the aquarium, and as this is one way of obtaining certain desirable results, keep it covered until the foul odor disappears, and if new plants do not appear in time, add plants and animals to suit, and it may prove to be the best aquarium you have. Marine Protozoa have been kept this way in jars brought from the seashore several years ago.

CENTRAL HIGH SCHOOL,
DETROIT, MICH.